

NEW AND CRITICAL EUPHORBIACEAE FROM THE TROPICAL FAR EAST

LEON CROIZAT

THE material dealt with in this paper belongs to the herbarium of the Arnold Arboretum of Harvard University and has been studied in the course of normal herbarium routine. In a recently published contribution on *Croton* L. in Guatemala (in Publ. Field Mus. Nat. Hist. Bot. Ser. **22**: 446–448. 1942), as well as in another on certain Euphorbiaceae of Texas (in Bull. Torrey Club **69**: 446–447. 1942), I have found reason to comment on the speciation taking place in this genus in the American range. Precisely the same order of facts is discernible in Asia that obtains on our continent; species of *Croton* which are identical or almost identical in their foliage turn out to have different ♀ flowers and capsules when carefully studied. Likewise, species that are apparently unrelated appear, whenever material is available, to be connected by endless intermediates which differ, each in its turn, by sums of minor characters if not of sheer intangibles. To deny recognition to such forms is neither possible or advisable, but to place them accurately, whether as species, subspecies, or varieties proves now impossible. As a compromise, which remains to be tested by field work and experimental cultivation, I have accepted for *Croton* a comparatively narrow specific concept in publishing some of the species in this paper.

CROTON Linnaeus

***Croton adumbratus* sp. nov.**

Frutex videtur vel arbuscula. Innovationibus furfuraceo-lepidotis, rufescentibus vel subargenteis. Foliis ovato-ellipticis vel elliptico-lanceolatis, apice cuspidatis, basi cuneatis obscure auriculatis, 8–20 cm. longis, 3–8 cm. latis, in sicco supra brunneis, glabris, subtus totis lepidotis, lepidibus centro brunneis quapropter indumento opaco, nervis primariis ca. 8-jugis, primo jugo adscendente caeteris patentibus, omnibus sub margine anastomosatis, sat tenuibus; petiolo 1.5–5 cm. longo, glandulis posticis 2 subsessilibus, patelliformibus. Inflorescentia subsimplici, spicata, 2-sexuali. Floribus ♂ in alabastro ca. 2 mm. magnis, pedicello in anthesi ca. 3 mm. longo. Floribus ♀: perianthio ovarium tenellum totum occultante ca. 6 mm. magno, pedicello in anthesi ca. 3 mm. longo, sub fructu ad 5 mm. longo, lobis ligulatis, apice subcucullato-incrassatis, disco e glandulis 5 discretis; ovario globuloso ca. 2 mm. magno, lepidoto, stylis iterum partitis, capsula rufescente tomentella, indumento detergibili, globulosa, sulcata ca. 7 mm. magna.

MALAY PENINSULA: *Griffith s.n.* (TYPE); *Maingay 1378*; *Griffith 4777*. SUMATRA: East Coast, *H. S. Yates 754*; *Rahmat si Toroes 1426*; *Rahmat si Boeea*; *Krukoff 239* in 1930; *Krukoff 4022, 4281* in 1932.

Griffith 4777 is cited by Hooker, Fl. Brit. Ind. **5**: 391. 1887, under *Croton erythrostachyus*. The specimens which I have seen under this number are

a mixture of *C. erythrostachyus* Hook. f. and *C. adumbratus*. The Griffith material from Malacca was correctly indicated as "*Croton* sp. nov.," but was later misdetermined as *C. argyratus* Bl. Hooker evidently confused under *C. argyratus* at least two species, Blume's authentic plant and *C. adumbratus*, it being likely that his concept (Fl. Brit. Ind. 5: 385. 1887), is based upon the latter rather than upon the former. My understanding of *C. argyratus* rests upon the following collections: (1) *Koorders 15685 B*, from the range of the classic locality ("ad montem Parang Prov. Tjanjor," Blume, Bijdr. 602. 1825 — apparently Mt. Karang near Tjiandoer of modern maps); (2) *Collector unknown*, Java, Sept. 1930, a duplicate from the Paris herbarium, probably wrongly dated, and possibly a century older than the year given by the label implies; (3) *Bangham 1092*, Sumatra, road from Kaban Dtjake to Kata Tjane; this collection is in fruit, the rather hard capsule being about 1.5 cm. long and broad, thus tallying with the size, "capsulae 15 mm. longae" given by Mueller-Argoviensis (in DC. Prodr. 15[2]: 527. 1866) for the fruit of *C. argyratus* var. *genuinus*. Despite a superficial resemblance with *C. argyratus*, this new species differs from it in the much weaker and smaller capsule and in minor details of the indument and of the ♀ calyx, being nearer, on the whole, to *C. potabilis* Croizat. It is probable that the majority of the references to *C. argyratus* in the Malayan peninsula apply to *C. adumbratus*.

***Croton biaroensis* sp. nov.**

Frutex vel arbor. Innovationibus plus minusve lepidotis, indumento citius deciduo. Foliis late ellipticis vel ovato-ellipticis, apice sensim acuminatis, basi cuneatis vel cuneato-rotundatis, 10–16 cm. longis, 4–5 cm. latis, in sicco lutescentibus vel brunnescentibus subcoriaceis firmis glabris, margine primo intuito integris parcius repando-dentatis, nervis primariis patentibus, obscure anastomosantibus 8–11-jugis, petiolo crassiusculo glabro, 2–2.5 cm. longo, glandulis posticis 2 sessilibus parvis. Inflorescentia simplici, gracili, ca. 10–12 cm. longa, 2-sexuali. Floribus ♂ in alabastro ca. 2 mm. magnis, pedicello ca. 2 mm. longo. Floribus ♀: perianthio 3 mm. longo, 3.5–4 mm. lato, pedicello ca. 2 mm. longo, lobis lanceolatis vel ellipticis acuminatis crassiusculis integerrimis, 2.5 mm. longis, 1 mm. latis; ovario globuloso, ca. 2 mm. magno, luteo-lepidoto, lepidibus sat latis fructu ineunte in epicarpio dissitis, stylis 3 dorso valde lepidotis ca. 2 mm. longis, tertio infero connatis, apice bifidis, planis, brunneis.

BIARO (north of Celebes): *E. Nielsen 812*, 1929 (TYPE). CELEBES: Minahassa, Bojong, *Warburg 15554*, 1898.

The Warburg collection was distributed as *C. laevifolius* Bl., which this new species but superficially resembles, as it is near *C. glabrescens* Miq., and probably also related to *C. erythrostachyus* Hook. f. It appears to be a localized endemic with affinities toward *C. leytenis* Croiz. that require further study.

***Croton oreoborneicus* sp. nov.**

Arbor videtur vel frutex magnus ad 40 ped. altus. Innovationibus glabris, valde immaturis pilis pluriradiatis grossis brunneis obsitis, serius glabris. Foliis ellipticis, apice late acutatis, basi longius cuneatis, 8–20 cm.

longis, 3–6 cm. latis, in sicco pallide olivaceis, firme chartaceis, glabris, nervis primariis ca. 8-jugis, primo jugo abrupte caeteris late adscendentibus, margine primo intuito integro, sub lente haud obvie denticulato vel repandulo; petiolo gracili, 1–6 cm. longo, glabrato, glandulis posticis 2 sessilibus patelliformibus. Inflorescentia ob cymas vulgo plures subspicatas terminales habitu paniculata sat ampla. Floribus ♂ in holotypo nullis, at videtur (e *Clemens* 20335) delicatis, vix ultra 2 mm. magnis, petalis sepalis aequilongis, pedicello subfiliformi ca. 3 mm. longo. Floribus ♀: perianthio ca. 2 mm. lato, 2–3 mm. longo, glandulis disci 5 extus tumescentibus perspicuis quapropter lobis basi primo intuito incrassatis, lobis ipsis triangularibus 1.5 mm. longis, 1 mm. latis, petalis nullis; ovario luteolepidoto 1.25 mm. longo, 2 mm. lato, stylis 3 fere e basi liberis, quove 0.75 mm. integro, dein 1.75 mm. partito; fructus delapsi coccis ad 7 mm. longis, delicatis, columella ad 5 mm. longa, seminibus brunneis, apice verruculosus, caruncula lineari ad hilum excurrente, ca. 5 mm. longis, 4 mm. latis.

BRITISH NORTH BORNEO: *Agama* 568, 1918 (TYPE).

Here to all appearances also belong: Sarawak: *Native Collector* 1744; Kina-bagatan: *Evangelista* 1006, 1929; Sarawak: Mt. Poi: *Clemens* 20335, 1929.

Few other species are so critical as *C. laevifolius* Bl., for around it, as around *C. argyratus* Bl. and many other forms of *Croton*, are countless entities which may appear almost identical in their gross morphology but are basically different in the characters of their ♀ flowers and fruits. It proves impossible for this very reason to accept *C. oblongum* Burm. f. as the legitimate binomial of the entity usually recognized as *C. laevifolius* Bl. before having made a critical study of the plant that might be preserved in the herbarium of Burman at Geneva under this name. Corner is justified, to all appearances, in treating (in *Gard. Bull. Straits Settl.* **10**: 294, 1939) *C. Griffithii* Hook. f. and *C. confusum* Gage as synonyms of *C. laevifolius*, the material I have seen supporting his conclusion. *Croton tiglioides* Bl., listed with doubt by J. J. Smith (*Meded. Dept. Landb.* **10**: 341, 1910) in the synonymy of *C. laevifolius*, seems actually to belong where Smith puts it, to judge from a specimen so named which I saw in the Paris herbarium and is now represented in our collections by a fragment, the gift of Prof. Henri Humbert.

Croton oreoborneicus essentially differs from *C. laevifolius* in the apparently much larger disc of the ♀ flower and in some intangibles of habit and foliage. It remains to be seen whether these characters are specific. The publications of varieties and trinomials is not advisable at this stage of investigation on account of the reasons briefly outlined in the introduction to this paper.

***Croton tawaoensis* sp. nov.**

Videtur arbor. Innovationibus grosse parciusque stellato-tomentosis, citius glabratis. Foliis late ellipticis vel ellipticis, interdum subovalibus, apice basique plus minusve longe acutatis vel cuneatis, 10–24 cm. longis, 3.5–8 cm. latis, glabris, in sicco pallide olivaceis vel badiis, firme chartaceis vel subcoriaceis, margine subintegro revolutis, nervis primariis 6–8-jugis utrinque tenuibus late adscendentibus, anastomosatis; petiolis longitudine valde ludentibus, 1–6 cm. longis, glandulis in petioli apice anticis 2 brevis-

sime stipitatis vel baculiformibus. Inflorescentia floribusque in holotypo haud suppeditantibus: capsula visa juniore, trigona, coccis apice gibbosis, solutis ad 8 mm. longis, endocarpio firmo osseo, exocarpio subtili toto ochraceo valde verrucoso stellato-tomentoso vel furfuraceo-lepidoto, semine ellipsoideo, ca. 7 mm. longo, 4–5 mm. crasso, sub lente acri testa verruculosa vel striata ad carunculam indumento peculiari e trichomatibus stellatis lutescentibus induta.

BRITISH NORTH BORNEO: Tawao, Elphinstone, *A. D. Elmer 21559*, 1923 (TYPE); distributed as *C. oblongum* Burm. f.

It would be impossible to separate this species from *C. laevifolius* Bl. and the forms in its vicinity but for the nature of the fruit. As stated previously, the foliage is practically the same and the flowers mostly differ in minute characters in the plants of this and allied groups. However, the epicarp sharply differs; in *C. laevifolius* it is smooth and sparingly stellate-tomentose to glabrous, while it is rough and verrucose, thickly tomentose to scurfy in *C. tawaoensis*. Such a difference I accept as fully specific, for to neglect it would call for the conclusion that the whole Sect. *Gymnocroton* Baill., which ranges from Assam, in N. E. India, to the Fiji Islands and Australia, consists of but one species. I suspect that *Villamil 379*, also collected in British Borneo and distributed as *C. laevifolius*, may prove to be *C. tawaoensis*; the indumentum on its ovary is thicker and coarser and has a much darker color than is usual for *C. laevifolius*.

***Croton avellaneus* sp. nov.**

Frutex vel arbor videtur ex affinitate proxima *C. argyrati* Bl., quocum notis vegetativis totis optime quadrat, licet foliis 6–10 cm. longis, 3–7 cm. latis, supra brunneis subtus totis fusco-argenteis, innovationibus lepidibus cupreis plus minusve dense indutis. Floribus haud visis: pedicello sub fructu crassiusculo ad 1 cm. longo, lobis perianthii ellipticis apice dilatatis integerrimis ad 5–6 mm. longis, columella sat gracili ad 10 mm. longa; capsula basi coarctata apice applanato-subtruncata, ca. 12 mm. longa, 10 mm. crassa, in coccorum dorso atque in dissepimentibus quoad visa lineata vel costulata revera haud trigona, epicarpio glabrescente brunneo, sat tenui, secedibili, endocarpio fragili; semine brunneo opaco scaraboideo, 9 mm. longo, 7 mm. lato, caruncula umbonata in arillum circumcircum confluenta, valde depressa, albo-cincta, testa grosse at haud profunde costulato-rugosa.

PHILIPPINE ISLANDS: Sulu Archipelago: Tawitawi, *Ramos & Edaño 43977*, 1924 (TYPE).

The Bornean plant represented by *Castro & Melegrito 1565*, 1923, from Banguay Island, British North Borneo, and *J. & M. S. Clemens 20099*, 1929, from Mount Poi, British North Borneo, probably belongs here despite slight differences in the size of the capsule. *Elmer 21201*, also from British North Borneo (Tawao), almost certainly belongs to *C. avellaneus*. Its ♀ flower has a perianth which is manifestly larger and coarser than that of *C. argyratus*, that is about 7 mm. long and 10 mm. wide, against a length of 4 mm. and a breadth of 6 mm. for Blume's species. The capsule of the type, *Ramos & Edaño 43977*, is essentially coarser and larger than that of *C. argyratus*.

Croton babuyanensis sp. nov.

Frutex videtur vel arbuscula. Innovationibus argillaceo-tomentosis, colore cupreatis cortice vetustiore albicanti. Foliis late ellipticis, apice breviter acuminatis, basi rotundato-cuneatis, integris, supra glabris brunneis, subtus conferte argenteo-lepidotis, nervis interdum laetius coloratis, firme chartaceis, primariis 4-6-jugis adscendentibus, petiolo 1-3 cm. longo glandulis posticis sessilibus obscuris. Inflorescentia simplici 2-sexuali spicata. Floribus ♂ ignotis. Floribus ♀: perianthio ca. 4 mm. lato et 3 mm. lato, *ovarium haud includente* (qua nota a speciebus in *C. argyrati* affinitate primo intuitu abhorret), pedicello ca. 3 mm. longo, lobis triangulari-acuminatis vel rarius ellipticis interdum apice incrassatis, costulato-venosis, ovario 3 mm. crasso, 2.5 mm. longo, cupreato-lepidoto, stylis visis valde mancis.

PHILIPPINE ISLANDS: Babuyan Group: Island of Dalupiri, *Bartlett 15086*, 1935 (TYPE); distributed as *C. argyratus* Bl.

A strong species, with a perianth that fails to inclose the ovary. Its characters suggest the Indo-Chinese *C. kongensis* Gagnepain, and its only known ally in the Philippines is *C. Novae-Astigis* Croiz., from the Province of Nueva-Ecija in Luzon, which appears to be less of a xerophyte and has ♀ flowers with much longer pedicels.

Croton Novae-Astigis sp. nov.

Arbuscula vel frutex. Innovationibus lepidoto-tomentosis vel lepidotis rubiginosis, citius glabratis. Foliis late ovatis, breviter vel brevissime apiculatis vel cuspidatis, basi obscure cordatis rotundatis vel subpeltatis, margine obiter distanctaque sub lente serratis, firme chartaceis, 12-15 cm. longis, 3.5-5 cm. latis, supra brunneis glabratis vel glabris, subtus argenteo-lepidotis, nervis utrinque ca. 7-jugis rubiginosis, primo jugo ramoso; petiolo sat crasso, 2.5-4.5 cm. longo, apice glandulis 2 posticis optime sessilibus supra limbi parte peltata sitis insignito. Inflorescentia simplici spicata. Floribus ♂ haud visis. Floribus ♀: perianthio vix 3 mm. longo ovarium haud includente, 4 mm. lato, pedicello evidenti ad 5-7 mm. longo, lobis lanceolatis, breviter acuminatis secus medium nervosis, carnosulis, disco e glandulis 5 sat magnis discretis, impressis, ad tori centrum positis, ovario cylindrico-ovoideo ca. 2.5 mm. magno, toto lepidoto, stylis 3 ad basim imam partitis quapropter primo intuitu ut videtur 6, ca. 2 mm. longis, carnis neque nigricantibus, dorso sublepidotis.

PHILIPPINE ISLANDS: Luzon: Province of Nueva-Ecija, Mt. Napu, *Alcasid & Edaño 5341*, 1939 (TYPE); distributed as *Mallotus ricinoides*.

Related to *C. babuyanensis*, described above, but having larger leaves, a somewhat different indumentum, and, primarily, a much longer pedicel under the ♀ flower. The specific epithet is the Latinized version of the name of the Province from which the type-collection has come.

Croton batangasensis sp. nov.

Frutex vel arbuscula. Innovationibus griseo-tomentosis vel argenteo-sublepidotis, frequentius tomentosis. Foliis plus minusve late lanceolato-ellipticis, apice breviuscule acuminatis, basi rotundatis subauriculatis, auricula altera interdum longiore, 5-9 cm. longis, 3.5-5 cm. latis, supra brunneis glabris, subtus griseo-canescens, indumento sublepidoto, margine primo intuitu subintegro sub lente sat crebre repando-serrato, nervis pri-

mariis ca. 7-9-jugis, primo jugo valde diminuto, sequente valde adscendente ramoso, caeteris primis adscendentibus demum sub apicem laminae latius patentibus; petiolo tomentoso 1.5-3.5 cm. longo, apice glandulis 2 posticis sessilibus insignito. Inflorescentia simplici spicata. Floribus ♂ haud visis. Floribus ♀: perianthio cupulato, ovarium totum occultante ca. 5 mm. magno, lobis imbricativis ad basim nempe agglutinatis, ellipticis, ca. 3 mm. longis et 1.5 mm. latis, intus valde laqueato-venosis, glandula ad basim auctis squamiformi, disco dissito, petalis nullis, ovario globuloso ca. 2 mm. magno tomentello-lepidoto, stylis 3 in columnam brevissimam (0.75 mm.) primo connatis, dein liberis, bis dichotomis, crure summo 2.5-3 mm. longo; capsula submatura lepidota ca. 6 mm. magna, columella gracili 5 mm. longa.

PHILIPPINE ISLANDS: L u z o n: Province of Batangas, *Ramos 22371*, 1914 (TYPE); distributed as *C. argyratus* Bl. var.

Quite unlike *C. argyratus* Bl. and reminiscent on the whole of *C. budopen-sis* Gagnep. from Indo-China.

Croton cotabatensis sp. nov.

Arbor parva vel frutex intricatus videtur. Innovationibus lepidibus cupreis primo indutis, citius glabratis. Foliis habitu, textura, indumento, forma vix ab illis *C. argyrati* Bl. eruendis, ca. 12-15 cm. longis, 3.5-5 cm. latis, subtus totis lepidotis, nervis primariis ca. 7-jugis. Floribus ♂ haud visis. Floribus ♀: perianthio ovarium totum occultante, ca. 7 mm. longo, 7 mm. lato, pedicello vix 2 mm. longo, lobis fere ad basim partitis ligulatis carnosulis, intus stellato-tomentosis, ca. 6 mm. longis et 2 mm. latis, petalis setaceis manifestis, ovario lepidoto, globuloso, ca. 2 mm. magno, apice sub-truncato-dilatato subinde in columnam stylarem evidentem ad 1 mm. longam abeunte, crure quove partito ad 4-5 mm. longo.

PHILIPPINE ISLANDS: M i n d a n a o: District of Cotabato, *Miranda 18271*, 1912 (TYPE).

Here belongs *Tarrosa, Miranda & Rafael 18794*, 1912, from the same district and, to all appearances, *Robinson 11829*, 1910, from the District of Zamboanga. The characters of the ♀ perianth are not those of *C. argyratus* and *C. Quisumbingianus*. From *C. cupreus* Elm. this new species appears to differ in the much longer and not sessile styles and in the larger perianth; a comparison of specimens in full fruit is desirable.

Croton Quisumbingianus sp. nov.

Arbor vel arbuscula innovationibus cupreato-argenteis, cortice adultiore griseo rugoso cicatricoso. Foliis cum illis *C. cotabatensis* fere ad assem congruentibus, floribus ♀ autem aliis, scilicet: perianthio gracilius longiusque pedicellato, pedicello ad 5 mm. longo, lobis minoribus, magis delicatis, inde perianthio toto ca. 6 mm. longo et 5 mm. lato neque 7-8 mm. longo latoque, petalis nullis vel (forsan) subnullis, ovario depresso-globoso, 2 mm. longo, 3 mm. lato, stylis e basi ipsissima liberis neque in columnam evidentem connatis, crure quove primum ca. 1.5 mm. integro, dein dichotomo, crure summo 2.5-3 mm. longo.

PHILIPPINE ISLANDS: L e y t e: *Wenzel 1250*, 1915 (TYPE).

Here also apparently belongs *Wenzel 1538*, 1915, from the same island. This is a very distinct species, with a delicate perianth, quite close to *C. potabilis* Croiz. from Indo-China, but not nearly allied with other species

of the Philippine Islands. I dedicate it to Dr. Eduardo Quisumbing of the Bureau of Science, Manila, to whom I am indebted for the communication of holotypic material and important data.

Croton cupreus Elm. in Leaf. Phil. Bot. 4: 1281, as *C. cuprea*. 1911.

Croton argyratus Merr., Enum. Phil. Fl. Pl. 2: 425. 1923, *p.p.*, non Blume.

Elmer's description is long but lacking in the essential data of the ♀ flower and the fruit. A dissection of a young fruit on an isotype, *Elmer 13236*, 1911, reveals that the ♀ perianth has petals matching those of *C. cotabatensis* but with lobes which are short and slender (about 3 mm. long and 1.5 mm. broad), and with styles that do not form a column but branch from the base and are not over 2 mm. long. The columella of a nearly ripe or ripe fruit is delicate, only 5 mm. long. In all these characters *C. cupreus* disagrees with *C. argyratus*. The foliage is thickish, with revolute margins, such as is frequently found in the xerophytic forms of the genus, and its "feeling," if not its color, is indeed reminiscent of *C. cascarilloides* Raeusch. (*C. Cumingii* Muell. Arg.), to which Elmer compares it.

Croton argyratus Bl. Bijdr. 602. 1825; Muell. Arg. in DC. Prodr. 15[2]: 526. 1866 (saltem quoad var. *genuinum*).

I have not seen specimens from the Philippine Islands which I can bring under this species. *Croton avellaneus* Croiz., described elsewhere in this paper, is the endemic to these islands which is nearest Blume's species, and it may be easily possible to treat it as a variety of *C. argyratus* by accepting a concept of specific limits which I am not ready to entertain for this group and region at present.

The exceedingly crude figure of *Croton racemosum* given by Burman f. (Fl. Ind. 206 [sphalm.: 306]. *pl.* 62, 2. 1768) suggests, in the shape of the leaf and in the perianth-like calyces, the habit of certain states of *C. argyratus*, and a study of the type that might be preserved in the herbarium of Geneva is advisable. The description of what Burman accepts as the typic form of the binomial consists merely of the note: "Croton (*racemosum*) foliis ovatis subserratis tomentosis, racemis terminalibus nudis . . . ex Java." As is known, the leaves of *C. argyratus* are not infrequently tomentose rather than silvery-lepidote underneath.

Croton rectipilus sp. nov.

Frutex vel arbuscula magnitudine ignota. Innovationibus hispido-pubescentibus, trichomatibus pilo vulgo centrali elongato setuloso-stellatis, serius glabratis brunneis. Foliis elliptico-lanceolatis, in sicco olivaceo-discoloribus vel brunneis subconcoloribus, utrinque acuminatis, 7–13 cm. longis, 2.5–5 cm. latis, glabris vel glabratis, tenellis dissite tomentello-setulosis, margine primum ciliato, dein glabro, repandulo vel subintegro vel integro, nervis primariis 7–10-jugis adscendentibus, petiolo 1–3.5 cm. longo, gracili, hispido-tomentoso, apice glandulis 2 sessilibus patelliformibus aucto. Inflorescentia evoluta haud visa. Floribus ♂ in alabastro ca. 2 mm. magnis, pedicello 2.5 mm. longo, lobis 2 mm. longis, 1 mm. latis, petalis (ut videtur) nempe ligulis hyalinis ciliatulis ad 1 mm. longis, staminibus ca. 10.

PHILIPPINE ISLANDS: Luzon: Province of Batangas, *Ramos 22356*, 1914 (TYPE).

Mueller Argoviensis cites specimens of Cuming and Llanos (in DC. Prodr. **15**[2]: 621. 1866) for his *C. Verreauxii* Baill. var. *angustifolius*, which may or may not be the same as *Ramos 22356*, listed by Merrill (Enum. Phil. Fl. Pl. **2**: 427. 1923) under Mueller's trinomial. Mueller's concept of *C. Verreauxii* is manifestly too comprehensive, his treatment of *C. Storckii* Seem. as a variety of Baillon's species having been rejected long ago by most botanists concerned with this complex. I find no reason to maintain under *C. Verreauxii* the plant typified by *Ramos 22356*, because this plant differs from the true *C. Verreauxii* far more than does *C. Storckii*, the foliage and pubescence of *C. rectipilus* being wholly unlike those of the Australian *C. Verreauxii* var. *genuinus*. A poor specimen that may belong to *C. rectipilus* is *Merrill 11547*, 1922, from the Island of Golo, originally distributed as *C. leiophyllum*. This specimen should also be compared with *C. luzoniensis* Muell. Arg. var. *bataanensis* Croiz., described elsewhere in this paper.

***Croton pampangensis* sp. nov.**

Frutex videtur vel arbuscula, innovationibus primum dissite stellato-tomentosis, citissime glabris. Foliis tenuibus, lanceolatis vel elliptico-lanceolatis, basi arctius cuneatis, 5–10 cm. longis, 1–3 cm. latis, in sicco brunneo-olivaceis, tenellis trichomatibus stellatis parvis perpauca adpersis, adultis glaberrimis, margine crenato-denticulatis, dentibus callosis ad 3 per 1 cm. longitudinis, nervis primariis ca. 8–11-jugis delicatis, adscendentibus, petiolo 1–3 cm. longo gracili, apice glandulis 2 stipitatis insignito. Inflorescentia spicata, 2-sexuali. Floribus ♂: perianthio ca. 2 mm. magno, pedicello gracili ad 1.5–2 mm. longo, lobis petalisque subaequilongis, staminibus ca. 10, toro vix lanuloso. Floribus ♀: perianthio pedicello vix 1 mm. longo fulto, ca. 2 mm. longo, 3–4 mm. lato, lobis imbricatis, plus minusve evolutis, glanduloso-punctatis, apice callosulis, integris, ovario 1.5 mm. longo, 1 mm. lato, stylis brevibus, ut videtur ad basim imam partitis.

PHILIPPINE ISLANDS: Luzon: Province of Pampanga, Apalit, *Ramos 41649*, 1923 (TYPE); distributed as *C. leiophyllum* Muell. Arg.

The resemblance between this new species and *C. phuquocensis* Croiz., from the island of Phu-quoc, at the southern tip of French Indo-China, is striking, only the glands at the upper end of the petiole serving to distinguish one from the other at sight. The floral characters are likewise altogether close in the two entities.

Croton pampangensis differs from *C. leiophyllum* Muell. Arg. in the very short-pedicelled to subsessile ♀ flower and in the details of the perianth. The nature of its pubescence and the serration separate it at sight from *C. rectipilus*.

***Croton leytenensis* sp. nov.**

Frutex vel arbuscula ignotae magnitudinis. Innovationibus primum trichomatibus stellatis multiradiatis valde adpressis, dissitis, argenteis vel rubiginosis indutis, citius glabratis vel glabris. Foliis ellipticis apice late acuminatis basi cuneatis, 5–11 cm. longis, 1.5–5 cm. latis, margine repandulis vel subintegris, in sicco viridibus vel discolori-olivaceis, supra glabris, subtus glabratis, nervis primariis 5–7-jugis late patentibus, delicatis; petiolo

tomentello-lepidoto vel glabrato, 0.5–1.5 cm. longo, glandulis 2 patelliformibus subsessilibus anticis insignito. Inflorescentia subspicata. Floribus ♂ : perianthio 5 mm. lato, pedicello ca. 3 mm. longo, lobis late triangularibus vel ovatis, 2 mm. longis, 1.5 mm. latis, petalis brunneis ligulatis, 2 mm. longis, 1 mm. latis, staminibus ca. 11, toro vix lanuloso. Floribus ♀ : perianthio subfoliaceo ca. 5 mm. lato, 2 mm. longo, lobis triangularibus saltem marginibus virescentibus, 1.5 mm. longis, 1 mm. latis, quove ad basim glandula sat magna aucto, petalis nullis, ovario globuloso, 2 mm. magno, indumento sat grosso rubiginoso e trichomatibus sublepidostellatis, stylis 3 e basi liberis, quove primum 1.5 mm. integro, dein 1.5 mm. partito, semine ca. 6 mm. longo et, 5 mm. lato, columella ca. 6 mm. longa, coccis fructus delapsi ca. 1 cm. longis, pericarpio hic inde indumento subevanido vestito.

PHILIPPINE ISLANDS: Leyte: Palo, *Elmer* 7133, 1906 (TYPE); distributed as *C. leiophyllus* Muell. Arg.

A very distinct species, not at all like *C. leiophyllus*, with obscure affinities, suggesting *C. biaroensis* Croiz. in the ♀ flower if not in the foliage. A sterile specimen, *Fénix* 28194, 1917, from Luzon, Apayao Subprovince, has a foliage that is reminiscent of that of *C. leytensis*, and despite the different range might ultimately be found to belong here.

Croton lancilimbus Merr. in Phil. Jour. Sci. **20**: 395. 1922, Enum. Phil. Fl. Pl. **2**: 426. 1923.

This outstanding species appears to be narrowly localized in the island of Basilan and in the adjacent Zamboanga District of the island of Mindanao (the type-locality). Its resemblance to *C. pontis* Croiz., from Tonkin, Indo-China, is striking, a connection between the *Croton* of the Philippine Islands and Indo-China being evident in this and four other species, *C. babuyanensis*, *C. Quisumbingianus*, *C. pampangensis*, and *C. batangasensis*.

Thanks to the friendly interest of Dr. Quisumbing, I have seen the holotype, *Ramos & Edaño* 36855. This collection is an excellent match for *Hutchinson* 3992, 1906, Basilan, which was distributed under the mis-determination *C. Verreauxii* var. *angustifolia*. Recent accessions which belong to this species are *Liborio Ela Ebaló* 912 and 929, 1941, both from the island of Basilan. The former is an absolute match of the holotype, and is reported by the collector to be a shrub along a creek, known in the Yakan language as "Nagus"; the latter bears at least one leaf fully 17 cm. long and 4 cm. wide, that is, larger than usual for the specimens I have so far seen. This collection (929) is described as a tree 5 m. high and about 5 cm. in diameter at the main stem, named in Yakan "Kalalayo." It is apparent that one and the same species is involved, despite the discrepancies in habit, size and vernacular names reported by the collector.

Croton consanguineus Muell. Arg. in Linnaea **34**: 101. 1865, in DC. Prodr. **15**[2]: 619. 1866; Merr. in Phil. Jour. Sci., Suppl. **1**: 78. 1906, Enum. Phil. Fl. Pl. **2**: 426. 1923.

Fragments of *Cuming* 1871, an isotype, collected at an unreported locality (see Merrill in Phil. Jour. Sci. **30**: 175. 1926), which is probably Leyte or South Luzon, are in our herbarium. These fragments are an excellent

match for the following collections, all distributed as *C. consanguineus*: *Wenzel 1291, 1435, 1759*, from Leyte; *Elmer 15437, 15631, 17266*, from Luzon, Province of Sorsogon, Irosin (Mt. Bulusan). In all these plants the indumentum is substantially the same; it consists of small grayish stellate trichomes, which even in the youngest leaves allow the glabrous under surface of the blade to show under the naked eye or the very weakest magnification. Adult leaves are scurfy-pitted underneath in a characteristic manner.

***Croton consanguineus* Muell. Arg. var. *molliusculus* var. nov.**

A planta typica quae indumento sat laxo subargillaceo gaudet (var. **genuinus** var. nov.), optime discedit indumento foliorum tomentello conferto molli, pedicello sub fructu paulo brevior, i.e. ca. 2 mm. (neque 3–6 mm.) longo.

PHILIPPINE ISLANDS: LUZON: Province of Cagayan, vicinity of Peñablanca, *Adduru 28*, 1917 (TYPE).

The material now available is insufficient to decide whether this peculiar plant, distributed as *C. luzoniensis* deserves a rank higher than varietal. The indumentum suggests *C. luzoniensis*, but the ♀ flower has the characters of that of *C. consanguineus*, differing only in the slightly shorter pedicel when in fruit. I do not believe that *C. luzoniensis* and *C. consanguineus* should be treated as one species, because their typic forms are clearly different. To bring these two entities together, a concept of species ought to be accepted which would automatically reduce *C. leiophyllus* Muell. Arg. to *C. laevifolius* Bl. and make impossible a critical classification of fully three-quarters of the forms of *Croton* endemic to eastern tropical Asia.

***Croton luzoniensis* Muell. Arg. in *Linnaea* 34: 118. 1865, in DC. *Prodr.* 15[2]: 624. 1866; Merr., *Enum. Phil. Fl. Pl.* 2: 427. 1923.**

An isotype, *Cuming 1136*, collected at Ilocos Sur, in Luzon, is represented in our herbarium by an excellent fragment. Very close to this plant, if not identical, are: *Ramos 43078* and *43277*, both from Bohol, and probably *Loher 13288*, Luzon, Province of Rizal, Montalban, represented in our collections only by a very poor specimen. These three sheets were mis-determined at distribution as *C. consanguineus*.

The indumentum of the typic form of *C. luzoniensis* is distinctly different from that of *C. consanguineus*. It consists of softish stellate hairs of light brown to orange color, thickly covering the innovations and both faces of the young leaf and in part persisting on mature leaves.

***Croton luzoniensis* Muell. Arg. var. *bataanensis* var. nov.**

A planta typica, quae foliis tenellis supra subtus molliter indutis statim dignoscitur (var. **genuinus** var. nov.), discedit foliis vix evolutis supra glaberrimis.

PHILIPPINE ISLANDS: LUZON: Province of Bataan, *Foxworthy 10850*, 1909 (TYPE).

The material has no ♀ flowers and cannot be placed with certainty on this account. It was originally distributed as *C. leiophyllus* Muell. Arg.,

which is apparently an error, as no forms of this species known to me have the softish stellate indumentum of *Foxworthy 10850*. This pubescence distinctly suggests *C. luzoniensis*, but Mueller's species has young leaves tomentose on both faces, not only underneath, which is an important differential character in *Croton*. So far as I can judge from the scanty material now available, *C. rectipilus* Croiz. is not this plant, because its pubescence is distinctly stellate-setulose, its young leaves being ciliate at the margins. More ample collections may show that a new species is involved here, rather than the variety of a known entity.

Croton palawanensis Merr. in sched. sp. nov.

"*Croton* n. sp. in ms.," Elm. in Leaflet. Phil. Bot. 4: 1281. 1911.

Croton heterocarpus sensu Merr. Enum. Phil. Fl. Pl. 2: 426. 1923; non Muell. Arg.

Arbuscula vel frutex lobis perianthii ♀ laxioribus exceptis, quoad visis, totus in floralibus cum *C. leiophyllo* Muell. Arg. optime congruens, sed foliorum notis insignis, primo intuitu pro specie propria pleno jure salutandus. Foliis ellipticis vel oblanceolato-ellipticis, 5–13 cm. longis, 2–6 cm. latis, pallide brunneis vel saepius olivaceis, evidenter coriaceis, margine revolutis obiterque crenato-serratis crenis ca. 2–3 per cm. longitudinis, venis adscendentibus ca. 8–jugis, gracilibus; petiolo 0.5–3 cm. longo, glandulis patelliformibus sessilibus cum folii epidermide confluentibus 2 posticis, in folio ipso imo neque in petiolo summo impositis.

PHILIPPINE ISLANDS: Palawan: *Foxworthy 857*, 1906; Puerto Princesa, Mt. Pulgar, *Elmer 12788*, 1911 (TYPE); vicinity of Puerto Princesa, Mt. Tapul, *Liborio Eballo*, 1940; Tagdaraga, *Alcacid 5961*, 1938.

Croton heterocarpus Muell. Arg. (*C. ardisioides* Hook. f.) appears to reach its easternmost limits of distribution at Banguay Island in British North Borneo (*Castro & Melegrito 1439*), the form there found being identical to the endemic of Malaya (*Griffith 4783*; *Corner 22233*). It bears to *C. palawanensis* a superficial resemblance in the crenate-serrate margin of the leaf, but altogether differs from it in the minute very short-pedicelled to sessile ♀ flowers and all the floral ♀ characters in general. *Croton leiophyllus* Muell. Arg., discussed next, has floral ♀ parts which cannot be distinguished from those of *C. palawanensis* on the material available here, although the lobes of the ♀ perianth are apparently more evolute, inclosing the ovary rather deeply. A character which immediately identifies *C. palawanensis*, not to mention the unique manifestly coriaceous leaf, is the position of the glands; these are set on the lower face of the blade, not at the extremity of the petiole but on the midrib itself, being confluent with the epidermis of the blade. The biotype which this species represents can promptly be identified and appears to be constant in collections made at the same general locality. Since all the species of *Croton* in this group, and of the genus in general, are classified mostly by sums of floral and vegetative characters and intangibles, I see no reason to withhold specific recognition to this plant on the ground that I am not able at this hour to identify it by floral characters. It should be noted that in the vicinity of Puerto Princesa, Palawan, is also found *C. leiophyllus* Muell. Arg., which has altogether different glands and chartaceous rather than coriaceous leaves.

Croton leiophyllus Muell. Arg. in *Linnaea* **34**: 103. 1865, in DC. Prodr. **15**[2]: 573. 1866; Merr. Enum. Phil. Fl. Pl. **2**: 426. 1923.

This species is typified by two Cuming collections, 998 and 1075, duplicates of which I have seen in the herbarium of the Paris Museum, fragments having been taken for our collections with the kind permission of Prof. H. Humbert. According to Merrill (in *Phil. Jour. Sci.* **30**: 175. 1926), *Cuming* 998 and 1075 were collected in Luzon, the former in the Province of Pangasinan, the latter probably in that of Zambales. *Cuming* 998, which, as seen, has a slightly larger ♀ flower, is fully matched by *Holman* 14, 1910, Luzon, Province of Laguna, Payete, while *Cuming* 1075, the ♀ flower of which is minute, is most close to *Cenabre* 29167, 1923, Palawan, Puerto Princesa. Differences in the size of the ♀ flower in this species do not seem to correspond to local forms and may represent either vegetative or fixed morphological states which will require careful study. A plant from Basilan, *Tacson* 24949 (erroneously distributed as *C. consanguineus*), has the small flower of *Cenabre* 29167, from Palawan, while *Fénix* 15657, from the island of Balabac, which lies between Palawan and Borneo, cannot be distinguished from the plant of Luzon with robust ♀ flowers represented by *Holman* 14. The slender-pedicelled ♀ flowers of *Cenabre* 29167 are suggestive of those of *Barros* 24079, Luzon, Province of Isabela, which is an isotype of *C. leiophyllus* var. *multiflorus* Merr., Enum. Phil. Fl. Pl. **2**: 426. 1923, but are shorter, forming only a transition to the characteristic form of flower of the variety, not as yet falling within its limits. Nothing can be done to study these plants critically with material that, like the specimen available here, has neither ripe capsules nor seeds.

CLAOXYLON A. de Jussieu

Claoxylon subsessiliflorum sp. nov.

Arbuscula ad 3–4 m. alta, innovationibus subherbaceis parcissime setulosis vel glabris. Foliis ellipticis, utrinque acuminatis, 10–15 cm. longis, 2–4 cm. latis, submembranaceis atro-olivaceis subdiscoloribus, sub lente tenuiter papillois glabratis glabrisve, margine obiter repando-serratis, nervis adscendentibus ca. 5–7-jugis gracillimis, alternis, glandulis anticis ad petioli basim valde obscuris vel nullis; petiolo flexuoso, herbaceo, 2–7 cm. longo. Floribus ♂ ignotis. Floribus ♀: cymula laterali (videtur), pauciflora setuloso-puberula ad 2–3 cm. longa, perianthio subsessili vel brevissime pedicellato, setuloso-puberulo, lobis ca. 4, fere ad basim liberis margine integris rotundatis, vix 1 mm. longis totidemque latis, petalis cum lobis (videtur) alternantibus, late quadrangulis, in sicco brunneis, ca. 1.25 mm. latis et 0.75 mm. longis, ovario ovoideo ca. 1.25 mm. magno, setuloso-puberulo, petala evidenter excedente, stylis 3 brevissimis papillois.

INDO-CHINA: Tonkin: Province of Sontay, Mt. Bavi, *Pételot* 2638, 1940 (TYPE); "Arbuste de 3 à 4 mètres en forêt claire."

The characters of the ♀ flower easily separate this new species from all others so far known in the region. Like *Croton*, *Claoxylon* speciates mainly by alterations of the organs of the ♀ perianth, the foliage remaining constant to fairly constant within the same affinity.

OSTODES Blume

Ostodes Katharinae Pax in Pflanzenr. 47[iv. 147. iii]: 19. 1911.

Known so far only from the type-locality in Yunnan. A new record for Indo-China is represented by *Pételot 6548* and *6567*, both collected in Tonkin, Province of Sontay, Mt. Bavi, in light forest at an approximate altitude of 700 m., in May and June 1940 respectively. The large hairy capsule of this species is altogether characteristic.

CHEILOSA Blume

Cheilosa Whiteana sp. nov.

Arbor videtur. Foliis ovatis vel rotundato-ellipticis, brevissime acuminatis, basi cuneato-rotundatis vel cuneatis, 9–12 cm. longis, 6–8 cm. latis, firme chartaceis supra olivaceis subtus ochraceo-brunneis, tenellis adpresse ochraceo-strigulosis, adultis pilis perpaucis in nervorum axillis exceptis glaberrimis, margine valde obiter distanterque repandulo-crenatis, crenis glandulosis, glandulis cicatricosis sessilibus, venis penninerviis curvato-adscendentibus ca. 7-jugis, trabeculis gracilibus, glandulis ad petioli radicem anticis 2 sessilibus obscuris; petiolo canaliculato rigidulo 2–4 cm. longo. Inflorescentiis ♂ ignotis. Inflorescentiis ♀ lateralibus subterminalibusque habitu subspicatis, ut visis ad 5 cm. longis, totis adpresse pallide ochraceo-setulosis, flore squamula triangulari minuta axillato, quove (an abortu tanto?) singulo, pedicello setuloso ca. 1 cm. longo, perianthio ca. 7 mm. lato, lobis 5 discretis ad 3 mm. longis, 1.5 mm. latis integris, extus setulosis, disco sub ovario continuo vel subcontinuo, 0.5 mm. lato, hic inde pilis adpressis obsito, ovario globuloso-ovoideo toto ochraceo-hispido, ca. 3 mm. magno, stylis 3 vix 1.5 mm. longis apice vix in stigmatibus partitis, semine valde immaturo ca. 1 mm. magno.

PHILIPPINE ISLANDS: Luzon: Province of Pampanga, Mt. Arayat, *Curran 17733*, 1910 (TYPE).

As now constituted, *Cheilosa* includes but two species, *C. montana* Bl., of Java, and *C. homaliifolia* Merr., of Leyte. This new species abundantly differs from both. It differs from *C. homaliifolia* in the perianth, styles, and the leaf, which even when young is glabrous in Merrill's species, while it is manifestly setulose in mine. *Cheilosa montana* has an altogether different kind of foliage. The specific name is for Mr. Alain White, senior author of "The Succulent Euphorbieae" to whom I am indebted for the communication of numerous specimens of that tribe.

SAPIUM P. Browne

Sapium plumerioides sp. nov.

Arbor vel arbuscula tota glaberrima. Ramulis ultimis subcarnosulis, cicatricosis, cortice levi rubro-brunneo fere elenticellato. Foliis conferte verticillatis suberectis, ad 10 cm. longis et 4 cm. latis, oblongo-spathulatis ad (vulgo) spathulatis, epidermide coriacea, mesophyllo succulentiore inde nervulis in sicco perspicue minuteque reticulatis, nervis primariis ad 15-jugis gracillimis late patentibus, costa carnosula ad apicem potius recurva quam revera mucronata, lamina a quinto supero in petiolum carnosum abeunte, margine crenulato-serrata glandulosa, hic inde hydatodiis (glandulis crateriformibus) more proprio insignita. Inflorescentiis 2-sexualibus

ad 7 cm. longis, sat crassis, rigidis, spicatis. Floribus ♂ ca. 12, in axilla bracteolae triangularis ad 1.5 mm. latae subintegrae aggregatis, glandulis 2 magnis, perianthio proprio minusculo integro vel subintegro, staminibus ca. 2. Floribus ♀ ignotis: fructu brevissime pedicellato eximie capsulari, ad 0.5 cm. longo latoque, bene trigono, coccis rotundatis.

PHILIPPINE ISLANDS: Babuyan Group: Dalupiri Island, *Bartlett 15167*, 1935 (TYPE).

The type was distributed originally as *Excoecaria* on the strength of its resemblance to material of *E. Kawakamii* Hayata, from Formosa, and I have myself been misled at first to accept it under that genus. However, the disposition of the ♂ flowers, about 12 of which are crowded in the axil of a single bracteole, is definitely the one characteristic of *Sapium*.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.